Surface Acoustic Wave Hygrometer for *In Situ* Meteorology

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Weather and climate depend on atmospheric phenomena at all scales, from large-scale atmospheric circulation to microphysical processes. *In situ* atmospheric profiles with high spatial resolution are important scientific observations enabled by the miniaturization of accurate sensor technologies. This paper will discuss the development of a miniature dewpoint hygrometer for *in situ* meteorology. Intrinsically more reliable than relative humidity sensors, chilled-mirror dewpoint hygrometers are commonly used in the laboratory for accurate humidity measurement. Using a surface acoustic wave device to detect condensation, we developed a dewpoint hygrometer with high sensitivity and fast response. In flight experiments conducted on the NASA DC8, SAW hygrometers measured atmospheric humidity transients with a response time over an order of magnitude faster than chilled mirror hygrometers. This work culminated in the development and flight of a reference radiosonde on a small balloon for accurate humidity profiles in Earth's troposphere. The radiosonde was equipped with GPS and a radio modem, enabling telemetry, tracking and post-flight recovery of the instrument. Following the successful flight test of the radiosonde, the SAW hygrometer was flown on NASA DC-8 during the Third Convection and Moisture Experiment, to provide *in situ* humidity measurements with high spatial and temporal resolution. In 1999, the SAW hygrometer was flown on NASA's Helios unpiloted aircraft as a demonstration payload. Future work will concentrate on improved power efficiency for long-term deployments.

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